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A METHOD OF OPTOMETRIC QUANTITATIVE ANALYSIS BY CERTAIN INTERPRETATIONS OF THE FINDINGS FROM A ROUTINE EXAMINATION*

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No attempt has been made to give anything new or original in this article. Neither will references be given as to the origin of the interpretations, which may sound new or novel to the reader.

No. 1. *Case History.* After getting the name, address, age and sex of the patient, the case history is the next step in a thorough optometric examination. Under this heading we will include the occupation of the patient, so that we may understand the use that the eyes are put to. Some of the more important items in case history are: Length of time last glasses have been worn; last physical examination; last oral examination; the nature of any previous sickness (including all the children diseases); condition of nose, throat, ears, stomach, kidneys, heart, lungs, intestines, and other organic pathology that the patient can tell about. Case history is an art which every optometrist should make an effort to develop, but it can be overdone in optometric work. Interpretations of the history will not be made in this outline, because we are only presenting the interpretations of the usual optometric work.

No. 2. *Symptoms.* Under this heading the first thing that is usually of greatest interest to the optometrist is the nature of the greatest difficulty or complaint. Symptoms are the cause of the visit of the patient, so we should investigate by asking the patient about all complaints that may be caused from some ocular disturbance. We should ask about blurring vision, headaches, dizziness, pain in and around the eyes, diplopia, burning, itching, watering, scratching of the lids, light flashes, photophobia, etc. Under this heading we will not attempt to make any interpretations. Many good texts are available for this purpose.

No. 3. *External Examinations.* Under this subject we observe the appearance of the lids, cilia, lid margin, conjunctiva, punctae, plica-semilunaris, sclera, blood vessels, cornea, iris, pupil, aqueous, etc. We

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make no interpretations for this heading.

No. 4. *The Uncorrected Visual Acuity.* The normal is the usual 20/20 or 1.00. Under this heading a recording of the uncorrected visual acuity of each eye should be made separately. We make no interpretations for this step; they are well enough known.

No. 5. *The Pin Hole Test for Visual Acuity.* The normal is the same as in No. 4 Test. If subnormal vision can be raised to the usual normal V. A., we can expect to give lens correction to produce this acuity. We make no interpretations for this test, as they are well known.

No. 6. *The Habitual Amplitude of Accommodation.* This test is made by measuring the closest point the patient can read fine print without a blur. Each eye is measured separately, and recorded separately. The normal is found in Donders table of amplitudes of accommodation.

10	years	old,	14.00 d.	30	years	old,	7.00 d.	50	years	old,	2.50 d.
12	"	"	13.00 d.	32	"	"	6.50 d.	52	"	"	2.00 d.
15	"	"	12.00 d.	35	"	"	6.00 d.	55	"	"	1.50 d.
17	"	"	11.00 d.	37	"	"	5.25 d.	57	"	"	1.00 d.
20	"	"	10.00 d.	40	"	"	4.50 d.	60	"	"	.50 d.
22	"	"	9.50 d.	42	"	"	4.50 d.	62	"	"	.25 d.
25	"	"	9.00 d.	45	"	"	4.00 d.	65	"	"	.00 d.
27	"	"	8.00 d.	47	"	"	3.50 d.				

We make no interpretations for this test. Look for induced amplitude accommodation in test No. 37 (19).

No. 7. *Motility of the Eyes.* The versions should be smooth in all directions. By blocking off one eye with a septum and having the other eye follow lateral and vertical movements, the eye which is blocked off is watched for lagging or jerking movements. Jerky movements and lagging indicates at least to the writer, that there may be a presence of toxemia. Under this test the voluntary convergence is tested. It should measure five inches or less without diplopia. This is equal to around 50. prism diopters of voluntary convergence. A receded near point of convergence is indicative of convergence insufficiency. Under this test the motility and size of the pupils are observed. There should be an active reaction to direct and consensual light, and also, an active reaction to accommodative-convergence.

No. 8. *Ophthalmoscope.* (This is the No. 1 step in the eighteen point routine examination.) A negative finding with the ophthalmoscope should present the following conditions: There should be a well defined outline of the nerve head; the nerve head must have a normal healthy pinkish color; the physiological cup should have the average width and depth; the arteries and veins should present proper proportion in size (2 to 3), and proper relation to each other in color; the fundus must be normal in all respects; and the vitreous clear. Every optometrist should be an expert with the ophthalmoscope. He should be alert in detecting the least abnormal appearance in an eye. A good text

on the ophthalmoscope should be in the hands of each and every optometrist.

No. 9. *Ophthalmometer.* (This is the No. 2 step in the eighteen point routine examination.) The usual normal finding is (with the universal) 45. d axis 0 with 45.50 d. axis 90. Low curves indicate hypermetropia, and high curves indicate myopia, but this expected cannot be counted on with any degree of accuracy. When an increase in the curves is found from year to year, it is said to indicate a visceral imbalance. The expected for the ophthalmometer is about .50 d. with the rules as above stated.

Ophthalmometer readings should be accurate, because the subjective findings should show the acceptance of the same amount of cylinder as indicated by the ophthalmometer.

No. 10. *Phoria at Distance.* (This is the No. 3 test in the Graduate Foundation Clinic outline and is known as the habitual phoria.) The test is made by having the patient observe an object (small letters) at 20 feet through a displacing vertical prism. The technique is to turn a great amount of prism base-out if there is esophoria and gradually reduce it until the doubled object is lined up. If it should prove to be exophoria, then turn a great amount of prism base-in, and gradually reduce until the doubled object is lined up. The expected for this test is orthophoria. If an esophoria is found it may indicate the presence of toxemia (stimulative). There should be no convergence active for this distance, unless it is due to a stimulation from systemic fatigue or to uncorrected hypermetropia, or to a set converged position of the eyes from continued close work for years. In typing cases an esophoria finding is placed in the B 2 type as a low finding. Base-in exercises or base-in constant wear prisms will correct an esophoria which may be aiding in affecting the eyes to the extent of causing ocular discomfort. The B 2 type case is one in which all findings are grouped, which show the need of base-in prism exercise. For every 1^{Δ} of esophoria found it is expressed by those following the Skeffington plan as 1. unit low or (3-1). If an exophoria is found, it is indicative of a convergence stress, needing base-out treatment. In typing cases an exophoria is placed in the C 2 type as a high finding. Base-out prism exercises, or base-out prisms for constant wear will correct an exophoria which may be aiding in affecting the eyes to the extent of causing ocular discomfort. The C 2 type case is one in which all findings are grouped which are in need of base-out prism exercises. An exophoria is placed as a high finding in C 2 types. For every 1. exophoria it is expressed (3-1).

No. 11 (or No. 4. In Graduate Clinic Foundation outline). *Static Skiametry.* The technique in this test must be closely observed. The patient must be reading letters (there must be visual attention) while the shadow is being neutralized in the other eye with lenses. When the shadow has been neutralized in one eye with lenses, let the patient have the net findings to look at the letters with and proceed to neutralize the shadow in the other eye. Do this on each eye at least twice. The net find-

ings are recorded. The expected in this test is the same as found with the trial case for best visual acuity. Since one eye is partially blinded by the light thrown into this eye to neutralize the shadow, perfect binocular vision is impaired to such an extent that the eye tested can easily deviate from binocular fixation. So, if this test should be found lower than the subjective test, a convergence impulse would be causing this covering of the plus that would be otherwise found. This convergence impulse can be caused by the presence of a stimulative toxic fatigue. Since it is not very apt to be due to an accommodative impulse on the convergence, because plus lenses inhibit this impulse, it is very apt to be due to a toxic presence. In typing cases as is done by Skeffington, it is placed in the A type as a low finding. The type A is one in which all findings indicating pathology are grouped. For every 0.25 D. Sph., either high or low, it is expressed as (4-1). If this test is higher than the subjective findings, it is placed in the B 1 type. This high finding indicates that there is a need for more plus than will be accepted without a blur. B 1. type is one in which all findings are grouped that indicate a need for more plus than the patient will accept without a blur. The patient is in need of stronger glasses for close work than will be accepted for clear distance vision. It is also one indication that there may be a latent hypermetropia which needs to be corrected, first by bifocals, and when it becomes manifest it is placed in the distance correction.

No. 12. *Dynamic Skiametry at 13 Inches or 20 Inches.* (This test is known as the No. 5 in the Graduate Clinic Foundation.) Absolute visual attention is also quite necessary in this test as in the foregoing test. The patient must be reading letters while the other eye is being shadowed for lens power. Do each eye at least twice. The expected in this test is the same as the previous findings. Of course, it is meant that the net findings should be the same as No. 4 net test, as in the previous test one eye is partially blinded, which prevents good binocular fixation. This near point test brings the two functions, accommodation and convergence, into greater activity. So either low findings or high findings are more probably due to an accommodative or convergence stress. In typing cases low findings for this test are placed in the C 1 type, is one in which all findings indicating a convergence stress, and in need of base-in prisms for constant wear are placed. High findings for this test are placed in the B1 type case. The B1 type case is one in which all findings indicating an accommodation stress, needing more plus than will be accepted by the subjective test are placed. In this test we must compare these findings with the No. 4 findings to see whether or not they are low or high. If this test is made at 13 inches deduct 1.50 D. Sph. for net findings.

No. 13. *Dynamic Skiametry at Forty Inches.* (This is the No. 6 step in the eighteen point examination.) At forty inches there is not so much activity of the accommodation and convergence as there is in the previous test. As in the other two skiametric tests, absolute visual attention is required of the patient. The expected for this test is the same

net findings as found in the No. 4 test. The usual deduction in this test is 0.25 D. Sph. If it is high it is indicative of an accommodative stress and in need of more plus than will be accepted in the subjective test. By giving base-in prism exercise we can bring this test out to a manifest hypermetropia and put the extra plus in the distance correction. So when this test is high we place it in the B.2 type. The B.2 type is one in which we place all findings showing a need of base-in prism exercise. If this test is found lower than the No. 4 test, it is indicative of a convergence stress and in need of base-out prism exercise. It is, therefore, placed in the C 2 type. The C 2 type is one in which all findings are grouped that show need of base-out prism exercise. As in the preceding test, low findings show that the convergence is making a big effort, and in so doing it is covering up some of the plus that should be placed in the distance lens correction.

No. 14. *The Subjective Examination.* The expected in this test is the lenses that will give the best visual acuity. More time and accuracy should be put in this test than any of the other tests. If there is a mistake made in this test the patient is liable to be uncomfortable, regardless of the kind of case we are dealing with. The cylindrical correction found in this test should be just about the findings in the ophthalmometer test after the proper deduction is made. If not, this case is very liable to be a grief case and should be handled as such. It is, however, best to prescribe the cylinder found in this test regardless of the ophthalmometer findings. The correction should be considered only temporary.

No. 15. *The Induced Distance Phoria.* This test is made with the new subjective findings in position. (This is known as the No. 8 test in the eighteen point examination.) The expected for this test is found by comparing it with the No. 3 test, and the influence of the subjective findings over the old correction. In other words, if we found in No. 3 an orthophoria with uncorrected vision and the subjective findings are a pair of plus 1.00 D. Sph., then the pair of plus 1.00 D. Sph. should induce the phoria to just 2^{Δ} of exophoria. Likewise if the subjective test shows a pair of —1.00 D. Sph. then this should cause the finding to become just 2^{Δ} of esophoria. These would be the normal and expected findings. When we find a low No. 8 it is indicative of the existence of pathology. It is placed in the A type case, because the A type is one in which all findings indicating pathology are grouped. If this test is found high it is indicative of a convergence stress, but it is not used in typing at this time.

No. 16. *The True Adduction.* This test is the amount prism base-out that causes blur at distance. (It is known as the No. 9 test in the Graduate Clinic Foundation.) It is the measurement of the power of convergence that may be forced without accommodation becoming active. Let us call attention to the fact that an error is liable to be made in this test, unless proper precautions are taken. We all know that prisms cause an aberration, which we may call prism aberration. We

have found that all vertical lines are pronouncedly affected by the prism aberration when the prism is base-out or base-in. So in making this blur test we have based the interpretations upon the blurring of very fine horizontal lines. The Clason instrument has just the right kind of chart for this purpose. Select the disc with horizontal lines in the astigmatic chart, stop off all the other balls with the small circular appeture, bring the lines from invisible to visible visual acuity, stopping at the point the patient is sure they see the lines. Turn the prism base-out over each eye 1 P. D. at time. Do this slowly. The point where the patient cannot see the lines by allowing five seconds time for them to clear is the measurement of the power of the true adduction test. The expected in this test is just 12 P. D. when orthophoria is found at distance. If there is an esophoria found in the No. 8 test, then the amount of the esophoria found must be added to the 12 P. D. to find the expected. If an exophoria in No. 8 deduct it from the 12 P. D. for normal. If there is a decided hyperphoria present, this hyperphoria must be corrected with prism base-up or base-down before making this test. If this test is found to be low, it is indicative of a convergence stress. It is showing a too close locked relationship between accommodation and convergence. While it is true that the Graduate Clinic Foundation uses this test to indicate an accommodative stress, we believe the reason for this interpretation is due to the fact that a plus lens correction reflects a stimulative effect on the convergence, the same as prism base-out exercise. We are using this test, therefore, to indicate a convergence stress, and it is being placed in the C1 type case. The C1 is the type in which all findings are placed that indicate a convergence stress and need of base-in prism for constant wear. While base-out exercises will raise this finding, it has been found that the wearing of base-in prisms will eliminate the discomfort quicker and easier, and be more convenient for the patient. It is, therefore, used in the C1. type, rather than the C 2 type, which indicates base-out prism exercises. When this test is found to be high it is a very favorable indication. It is one test that indicates, when high, that the patient will be easily handled. The higher this finding the greater the indication that the patient can be handled without grief, regardless of what type of case it happens to be. So, when there is a high finding in this test it is placed in the N. type. The N. type is one in which all findings are grouped, which indicates that (regardless the kind of type showing up dominent) the case is to be easily handled and with the assurance of good results. In fact, the larger the units found in the N. type in proportion to the units found in other types, the less need is there for anything to be done for the patient.

No. 17. *The Convergence-Accommodation Test.* (This test is known as the No. 10b in the Graduate Clinic Foundation.) The test is prism base-out to break at distance. We determine the amount of accommodation associated with, and forced by convergence. The minimum amount of accommodation for comfort, in association with and forced by convergence, is positive relative accommodation of 3.00 D. Sph. and this is expressed in prism diopters equivalent to just 6 P. D.,

so the expected for this test is just 6 P. D. more than the blur point power found in the previous test. This test is the diplopia. If it is found to be lower than the expected it is indicative of a convergence stress associated with accommodation. It indicates that the patient is in need of base-out prism exercise or base-in prisms for constant wear. It is easiest raised to the normal by the base-out exercises, so it is placed in the C2 type case. The C2 type is one in which all findinsg are grouped that need base-out prism exercise. When this test is found high, it too, is indicative of a favorable condition. It is another test, when high, that indicates the patient will improve easily, regardless of the type of case that is showing up. So, when this test is found high it is placed in the N type.

No. 18. *The Positive Reversion to Fusion at Distance.* (This test is known as No. 10c in the eighteen point examination.) It shows the desire to see singly. In healthy individuals there is every reason to believe that the refusion should be near in power to the blur point. However, it is found that there is a small amount of tonic positive accommodation active as long as there is single vision, and this amount of accommodation seems to become inactive the instant diplopia occurs. So in addition to the convergence-accommodation of 6 P. D. that must be deducted from the diplopia power, there is also another 3 P. D. of tonic positive accommodation expressed in prism diopters that becomes inactive when diplopia occurs. In other words, the expected for this test is just 3. P. D. less than the blur point power. If No. 10c is found to be low it is indicative of a fatigue of the general nervous system, usually due to septic absorption from some focal infection, autointoxication, or a fatigue due to poor nourishment and overwork with too little rest. So No. 10c when low is placed in the A type. The A type case is one in which all findings are grouped which indicate pathology, or a general fatigue, and needs other than optometric treatment for relief. If No. 10c is found high it is an indication that the abduction recovery is in need of being built up in proportion to this high adduction recovery, or that the adduction should be somewhat reduced in the recovery power. While it may not be possible to raise the abduction recovery to the normal it can be raised in proportion that the blur is raised, but the abduction recovery will still remain a low finding in comparison with No. 11a and be indicative of a pathology. Neither can this No. 10c be reduced to show a low finding. It will however be reduced in proportion to the No. 9 test which gives a better balance. So, if this finding is high, it is placed in B2 type case. The B2 type is one in which all findings are grouped that are in need of base-in prism exercise.

No. 19. *The True Abduction to Blur.* (This test is known as the No. 11a in the Graduate Clinic Foundation.) It is the distance base-in prism to blur point. The same fine horizontal lines are used in this test as were used in the true abduction test, or No. 9. The expected in this test is 5 P. D. when there is orthophoria at distance, but should there be found an esophoria or an exophoria at distance, allowance must be made for the expected in this test. When an esophoria

is found, it must be deducted from the 5 P. D. to get the true expected. Likewise, if there is found an exophoria at distance, this exophoria must be added to the 5 P. D. to get the true expected in this test. If low it is indicative of a too closely locked negative convergence-accommodation and is in need of a greater amount of plus than will be accepted subjectively. This extra plus is needed for close work to give comfort. Bifocals, or extra strong close work glasses, will relieve the stress. So a low No. 11a is placed in the B1 type case. The B1 type is one in which all findings, showing a need for stronger plus than the subjective findings will give, are grouped. If the No. 11a is found to be high it is showing a convergence stress. It is another test that shows the need of base-in prisms for constant wear, but can be remedied by base-out exercise. However, by wearing the base-in prisms, the relief is easily given to the patient without the need of taking the base-out exercise. So it is placed in the C1 type case. The C1 type case is one in which all the findings indicating that the trouble can be taken care of by base-in prisms for wear, are grouped.

No. 20. *The Negative Convergence-Accommodation.* The test is made with prism base-in to break. (It is known as the No. 11b test in the eighteen point examination.) This test shows the amount of negative accommodation in association with and forced by the negative convergence. The power is from base-in to blur to base-in to break. The expected is 2 P. D. more than in the blur test, or No. 11a. This shows that there is and should be a small amount of tonic positive accommodation in use in normal conditions. If high it indicates too much negative accommodation in reserve and associated with negative convergence. It is a stress on the positive convergence act. It can be corrected best by prism base-out exercise but can be helped by base-in constant wear prisms. Since the indications are that base-out exercise will be the best to help this condition, it is placed in the C2 type case. The C2 type is one in which all findings are grouped that are in need of base-out prism exercise. If this test shows up low it indicates too little negative accommodation in reserve and is best remedied by base-in exercise. A reduction in the plus correction for distance from the subjective findings will build up a negative accommodation reserve associated with the negative convergence, but the base-in exercise are indicated for best results. So a low finding in this test will be placed in B2 type case. The B2 type is one in which all findings that show the need of base-in exercise to remedy the discomfort are placed.

No. 21. *The Negative Reversion to Fusion.* This is a fusion desire test. (It is known as No. 11c test in the eighteen point examination.) In a healthy individual there is all reason to believe that this recovery point should be the same as the blur point. Since negative accommodation seems to be not effective in this base-in test for distance, as was found in the recovery of positive convergence, no allowances have been made for a reduction from the blur point to find the expected recovery point in this test. The expected is then just that amount found in the blur point negative convergence, or abduction test. If

this test is low it is indicative of a general fatigue. This fatigue being brought about by septic absorption of toxins from focal infection, auto-intoxication, or fatigue from poor nourishment, overwork and too little rest. It is placed in the A type case. This A type is one in which all findings are grouped that show a toxic condition and need of other than optometric treatment. If No. 11c is high it is indicative of a convergence stress showing up, as an over abduction by the high recovery. It is placed in the C2 type and is one in which all findings are grouped that show a need of base-out prism exercise.

No. 22. *Vertical Phorias at Distance.* (This test is known as No. 12a in the eighteen point examination.) By disassociating the two eyes with a horizontal base-in prism we test the amount of vertical phoria. The base-up or base-down prism before either eye to cause the two objects to be in a horizontal line is the measure of the vertical phoria. The expected in this test is orthophoria. A vertical phoria of slight amount, or up to 1^{Δ} is not to be seriously investigated in the first examination. Any amount above 1^{Δ} should be compared with the vertical ductions, and the near vertical phoria and near vertical ductions. If the phoria is present of like amount in the near point vertical phoria test and is proven in the distance and near vertical duction tests, it is apt to be true hyperphoria and due to some pathologic disturbance. The vertical phorias and ductions, both distance and near, are not used in typing cases. A vertical phoria should require special study and not be typed in with the other findings. Peckham has given this imbalance much study and since it is so complex and since there are so many types of vertical phorias, it seems impossible to use this imbalance in typing cases as we have set out to do in this study.

No. 23. *The Distance Vertical Ductions.* (This is known as No. 12b in the Graduate Clinic Foundation.) The expected is the same amount of ductions both ways. In this study we will not give further time to this muscular phennea, as in No. 12a we have discussed it sufficiently.

No. 24. *The Habitual Phoria at the Near Point.* (This test is known as No. 13a in the routine eighteen point examination.) We advise making this test the first near point test in the outline. The expected in No. 13a when there is orthophoria at distance (habitually), is just 6^{Δ} of exophoria. If there should be found an habitual esophoria at distance or 2^{Δ} then the near phoria, to be normal, should be 4^{Δ} of exophoria. This gives the expected of 6^{Δ} of physiological exophoria. If there is an habitual exophoria of 2^{Δ} at distance, then the near phoria should be 8^{Δ} of exophoria to give the usual expected of 6^{Δ} of physiological exophoria. If it is low it is indicative of a need of more plus for close work than is shown in the subjective test. When low it is placed in the B1 type case. The B1 type is one in which all findings are grouped that show a need for more plus than is shown in the subjective test.

No. 25. *The Induced Near Phoria.* (This test is known as No. 13b in the Graduate Clinic Foundation.) The expected in this test

is found by comparing this test with the No. 13a and noting the influence of the subjective findings on the No. 13b. For every plus 0.50 D. Sph. found over the previous correction worn by the patient the No. 13b should be increased by 1$^{\Delta}$ of exophoria or less 1$^{\Delta}$ of esophoria, and for every — 0.50 D. Sph. found over the previous correction the induced phoria at near should be reduced 1$^{\Delta}$ of exophoria or increased 1$^{\Delta}$ of esophoria. If No. 13b is found low after making the proper allowance it is indicative of pathology, a stimulative general fatigue. It is placed in the A type case. The A type is one in which all findings indicating pathology are grouped. If this No. 13b is found high after making all allowances it is indicative of a convergence stress, which would be brought on by an increase of plus correction. This condition is best cared for by combining with the correction base in prisms for constant wear. This is placed in the C1 type. This C1 type is one in which all findings indicating need for base-in prisms for constant wear are placed.

No. 26. *Another Induced Phoria Test at the Near Point.* (This is called by the writer the No. 13c test to conform with the numbering in the eighteen point examination.) This test is made immediately after the No. 17c test, but is being discussed at this point for convenience. It reveals valuable information to be used to find the expected in the No. 16a test, and will be explained in that test. It is also used to find the expected in the No. 17a test. The expected in this test is just 2$^{\Delta}$ more than in No. 13b test. It is not used by itself in typing cases, but is used in the No. 16a test to determine whether or not No. 16a is high or low, and to get the expected for 16a, and to determine whether No. 17a is high or low and to get the expected for No. 17a. This test requires some care in technique. After finding the No. 17c, which is the recovery, the prisms are left in position and the two eyes are disassociated by vertical prism as in all lateral phoria tests. The question must be always asked the patient, "Are the letters or lines clear and distinct?" If they are not the patient is requested to blink the eyes or hold them closed for a few instants and then make an effort to see clearly. If the letters or lines do not clear by effort a slight elapse of time will clear them for the patient. After the letters or lines are seen clearly, then proceed to line up the two targets in the usual way and record for reference in the No. 16a and 17a tests. No other use is being made of this test at this time. If plus lenses are increased until the lines clear up it will give an indication of the amount of plus that may be used with good advantage by the patient for close work glasses, if such are indicated in the type picture.

No. 27. *The Cross Cylinder Test, Under Disassociation by Vertical Prisms.* (It is known as No. 14a test in the eighteen point examination.) The expected for this test is plus 1.00 D. Sph. more than is found with the trial case. A 0.25 D. Sph. high or low is counted as one unit in typing. If it is found low it is indicative of a need of relaxation of the accommodation, which reflects a convergence stress. This relaxation can best be brought about by incorporating

base-in prisms for constant wear in the lens correction. It is, therefore, placed in the C1 type case. The C1 type is one in which all findings needing base-in prisms for constant wear, are placed. If it is high it is indicative of an immediate need for more plus than is shown in the subjective findings. The patient needs stronger plus lenses for close work than the distance subjective findings show. This extra plus is nicely supplied by giving bifocals. It is therefore placed in the B1 type case. The B1 type is one in which all findings indicating a need of bifocals are placed; in need of stronger plus for near than will be tolerated for good distance vision.

No. 28. *The Induced Phoria With the Cross Cylinder Findings in Place.* (This test is known as the No. 15a in the Graduate Clinic Foundation.) The expected is found by adding just 1 P. D. to the No. 13b test for every plus 0.50 D. Sph., found in the No. 14a over and above the distance subjective findings. If No. 15a is found high, it is indicative of a convergence stress brought on by the extra plus found in the No. 14a test. Such a convergence stress shows the need of constant wearing of base-in prisms, or it can be helped by base-out exercise. We find that this test shows that the base-in prisms for constant wear remedy the difficulty easiest and with less inconvenience to the patient. So it is placed in the C1 type case when high. The C1 type is one in which all findings are grouped where a need for base-in prisms for constant wear is indicated. If it is found low it is indicative of an accommodation stress and in need of extra plus for close wear. As the B1 type is one in which all findings showing need for extra plus for close wear are grouped, it is placed in this type case.

No. 29. *The True Positive Fusion Convergence Reserve at 13 Inches.* (This test is known as the No. 16a test in the Graduate Clinic Foundation.) The technique for making this test is as follows: A fine dot the size of a typewriter period is placed in the center of a square made by fine hair lines, measuring 1 cm. or 10 mm. in diameter. This square is made by placing three hair lines on all four sides. While the dot alone is used in the No. 16a test the whole square is used in the No. 16b and No. 16c tests. The vertical lines and horizontal lines are also used in the cross cylinder test. After much experimenting with different kinds of targets for making this near blur point test we have found this simple little dot the most accurate and easiest for the patient to understand. The patient is requested to observe the dot only and keep it clear while base-out prisms are placed before the eyes. The patient is further requested to tell you the first instant the one dot appears to be two, slightly separated from each other. The patient will notice a refusion of the dots and then doubling. In other words, the patient will see first one then two dots emerging and separating. The patient is also requested to let you know when the one dot becomes a blurred circle rather than two dots, this sometimes happens instead of two dots appearing. Either of these phenomena are the end point in the blur point test. This test gives us the measure of the power of reserve of true fusion convergence for this distance, and the No. 13c

gives us the actual amount that must be used to hold single vision. So the expected in this test, to keep two-thirds in reserve required for comfort, is jut two times the No. 13c test. If this test is found to be less than this amount it is indicative of a convergence stress. This convergence stress can be taken care of by prescribing prisms base-in for constant wear, it can also be eliminated by base-out prisms exercise. We have found the base-in prism for constant wear the best method for giving the patient immediate comfort, and also that the fusion reserve often seems to build up in the course of a year or so by this therapy. So, if we find this test low we place it in the C1 type case. This C1 type is one in which all findings are placed which show the need of base-in prisms for constant wear. At this point we must mention the method of arriving at the amount of required base-in for constant wear for close work. Since only one-third of the total of fusional convergence can be used continually without discomfort, and the No. 13c plus the No. 16a is the total, and since the No. 13c is the actual amount that must be used for single vision, we divide the total fusional convergence by three to find the one-third that can be used with comfort. Should this one-third, that can be used with comfort, show less than the No. 13c, it shows we will have to supply the difference in prism base-in for constant wear. A full correction of base-in for constant wear is further governed by the showing of the No. 11c findings. Peckham has shown that a hypermetrope showing esophoria can only use one-third of the distance abduction recovery of prism base-in with comfort for distance, so we may have to modify the base-in correction for constant wear by noting whether or not this test shows the same as No. 16a or less. In the cases where the No. 11c shows that no prism base-in for constant wear can be used, and the No. 16a test shows that considerable amount of prism can and needs to be used, then we would have to give the base-in in the reading segment of the bifocals, or give close work glasses with the prism base-in based on the No. 16a findings. If No. 16a finding is high it indicates a favorable condition regardless of the type case we have. Such a high finding tells us that this patient will, in all probability, be easily cared for. So when the No. 16a is high it is placed in the N type case. The N type case is one in which all findings indicating favorable results are grouped, regardless of the type found otherwise.

No. 30. *The Positive Convergence Accommodation Reserve at 13 Inches.* (This test is known as No. 16b in the eighteen point examination.) The test is base-out to diplopia. The expected is determined by adding 6 P. D. to the blur finding. Since there should be about 3.00 D. of positive accommodation in reserve at 13 inches and since this 3.00 D. Sph. can be expressed as 6 P. D. we find the expected is just 6 P. D. more than the blur for this test. Presbyopes excepted. For every plus 1.00 D. Sph. added, deduct 2 P. D. for expected. If this No. 16b is high it is indicative of a high accommodation in association with convergence and forced by convergence in reserve and can best be lowered by base-in exercise. It is therefore placed in the B2 type as

this B2 type is one in which all findings are grouped which show need of base-in exercise. This test, if found to be low, is indicative of a convergence stress, or too little accommodation in reserve associated with convergence and forced by convergence. It can be built up by base-out exercise and is placed in the C2 type case, as this is one in which all findings needing prism base-out exercise are grouped.

No. 31. *The Positive Reversion to Fusion.* (This is a fusional desire test. It is known as No. 16c in the Graduate Clinic Foundation.) The test is made by coming from diplopia to single vision. In this test the expected is just 3 P. D. less than No. 16a test. This 3 P. D. allowance has been made due to a small amount of tonic accommodation not being active after diplopia has occurred. A normal healthy individual should have a recovery point about equal to the blur point power. In this instance we have made the allowance of 3 P. D. If a person experiences fatigues due to focal infection or auto-intoxication, or is in senile condition, this finding will be low. So a low finding in this test is placed in the A type case as this type is one in which all findings that indicate a general fatigue are grouped. In addition to making the 3 P. D. allowance in this test, there is another instance wherein a further allowance must be made and the finding still be normal. In case we find in the No. 13c test an exophoria over 10^{Δ} we must deduct 1 P. D. for every 1^{Δ} of exophoria over 10^{Δ} of exophoria. If this test shows a high finding after making the proper allowances it shows a need of toning up the antagonist function, and this can best be done by base-in prism exercise. So a high finding in this test is placed in the B2 type case, as this type is one in which all findings indicating the need of base-in prism exercises are grouped.

No. 32. *The True Negative Fusion Convergence Reserve.* (This test is known as the No. 17a in the eighteen point examination.) This test is base-in prisms to blur point at 13 inches, as all near point tests are made. The same target and the same technique is needed in this test as is used in the No. 16a test. The expected for this test is found by adding the No. 13c finding to the 11a finding. If this finding is low it is indicative of need of more plus than is shown in the subjective test, or the need of stronger glasses for close work. It is placed in the B1 type, because all findings that indicate a need for bifocals or stronger glasses than No. 7 for close work, regardless of age, are grouped in this type. A high finding in this test is a favorable indication. Regardless of the dominant type showing, a high No. 17a is one test that shows that there can be given good results with the proper treatment indicated. So we placed a high finding in this test in the N type case as this type is one in which all findings indicating this favorable condition are grouped.

No. 33 or No. 17b. *The Negative Convergence Accommodation Reserve.* This test is made by base-in to diplopia at the usual 13 inches. Using the same technique as in the other near tests. The expected in this test is found by adding 8 P. D. to the blur point power findings. Since this is a near point test at 13 inches there is an actual use around 3 D.

Sph. of positive accommodation which becomes relaxed in this negative convergence-accommodation test. In addition to this there is also a small amount of tonic accommodation in use during this near point test. This also becomes relaxed by the base-in prisms. This amount is equal to 2 P. D. and the other is equal to 6 P. D., so the total is 8 P. D. which is the amount to add to the blur point power to find the expected in this test. If this test is found high it indicates too much negative convergence-accommodation in reserve. To make this more normal we can give base-out exercise, so it is placed in the C2 type case as this type is one in which all findings needing base-out exercise are grouped. If this finding is low it indicates too little negative convergence-accommodation in reserve. To make this finding more normal, we can give base-in prism exercise, so place it in the B2 type case, as this is one in which all findings needing the base-in exercise are grouped.

No. 34. *The Negative Refusion Test.* This is a fusion desire test. (It is known as the No. 17c test in the Graduate Clinic Foundation.) The test is made by finding the prism power to recovery after diplopia has occurred. The expected is the same prism power as the No. 17a test. There cannot be any deduction on this test as was made in the No. 16a test, because the tonic accommodation is not effective in this test. In fact the effectiveness, if at all, would be to increase the recovery power over the blur point, if any allowances were made. The condition which is more apt to lower this recovery power below the blur point power is that of general fatigue. This general fatigue may be due to a septic absorption from focal infection and autointoxication, or extreme fatigue due to overwork, too little rest and poor nourishment. This particular fatigue is an over stimulation, or it may be called a stimulative toxemia, whereas the low finding in the No. 16c test could be called an exhaustive toxemia. We believe that a toxemia of a slight amount would show up as a stimulative effect, and a very great amount of toxic presence being carried in the blood streams would show up as an exhaustive effect. This test would indicate a stimulative toxemia when low. So when it shows a low finding it is placed in the A type case as this is one in which all findings indicating pathology are grouped. If we find this test high it is one more test indicating favorable results for the patient by the proper optometric treatment. So we place it in the N type case as this is the type in which all findings which are favorable to the patient are grouped.

No. 35. *The Near Point Vertical Phoria Test.* (This is known as the No. 18a test in the Graduate Clinic Foundation.) Since this test has been very briefly discussed in the No. 12a test we will pass over it without further discussion.

No. 36. *The Near Vertical Ductions.* (This test is known as the No. 18b test in the eighteen point examination.) We will pass over this test without further discussion at this time or in this study. All vertical phorias and duction require special study for proper interpretation.

No. 37. *The Induced Amplitude Accommodation.* (This test is one that has been added and adopted by the Graduate Clinic Foundation and is known as the No. 19 test.) The amplitude of accommodation is measured by finding the nearest point to the eye a patient can read fine print clearly. The expected in this test is found by referring to Donders table of amplitudes for the different ages. This table has been given the No. 6 test. If this test is found to be low it simply indicates a need of plus, or more plus than found in the subjective test for close work. If this test is found to be higher than the Donders table, it is indicative of a very active accommodation. Such a high finding shows a favorable outcome for the patient, regardless of the type case we are dealing with. So we place this high finding in the N type case as this type is one in which all findings which indicate a favorable condition are grouped.

No. 38. *The Tolerance for Plus Addition at 13 Inches.* (These tests are called No. 20a in the Graduate Clinic Foundation.) They are made as follows: Add plus 1.00 D. Sph., O. U., to the best visual acuity findings and test for the blur, and recovery powers, prism bases-in and prism bases-out. The expected is for the addition of plus 1.00 D. Sph., there should be a decrease of just 2 P. D. in the base-out findings compared with No. 16a, 16c and there should be an increase of just 2 P. D. in the base-in findings compared with Nos. 17a, 17c. There is a convergence stress indicated when for prism bases-in the change increases No. 17a and 17c less than 2 P. D. and when for prism bases-out the change decreases No. 16a, 16c greater than 2 P. D. There is an accommodation stress indicated, when for prism bases-in, the change increases No. 17a, 17c, greater than 2 P. D., and when for prism bases-out it decreases No. 16a, 16c less than 2 P. D. For example we will say in No. 16a and 16c we found 20. blur and 17. recovery and in No. 17a and 17c we found 18. blur and 15. recovery. Now in No. 20a we have added plus 1.00 D. Sph., O. U. In a convergence stress the findings would be changed something like the following: For base-out 17. blur and 14 recovery, and for base-in 19. blur and 16. recovery. This plus 1.00 D. Sph. added to the best visual acuity finding in convergence stress have influenced the No. 17a and 17c to an increase of only 1 P. D., and have influenced the No. 16a and 16c to a decrease of 3 P. D. in this test. Now using the same example in an accommodative stress the findings would be changed something like the following: For bases-out 19. blur and 16. recovery, and for base-in 21. blur and 18. recovery. This plus 1.00 D. Sph. added to the best visual acuity findings in accommodative stress have influenced the No. 16a and 16c to a decrease of only 1 P. D., and the No. 17a and 17c to an increase of 3 P. D. in this test.

The findings under this heading are not used at this time in the quantitative analysis method, but nevertheless are quite valuable check tests for cases that seem to be questionable as to the definite type.

No. 39. *The Tolerance for Minus Addition at 13 Inches.* (These tests are called No. 20b in the Graduate Clinic Foundation.)

They are made as follows: Add minus 1.00 D. Sph., O. U., to the best visual acuity findings and test for the blur and recovery powers, prism bases-in and prism bases-out. The expected, for every minus 1.00 D. Sph., addition to the best visual acuity findings there should be an increase of just 2 P. D. in the base-out findings compared with the No. 16a and 16c, and there should be a decrease of just 2 P. D. in the base-in findings compared with the No. 17a and 17c. There is a convergence stress indicated when for prism base-out the change increases No. 16a and 16c more than 2 P. D., and when for prism base-in the change decreases No. 17a and 17c less than 2 P. D. There is an accommodative stress indicated when for prism base-out the minus add increases No. 16a, and 16c less than 2 P. D. and when for prism base-in the minus add decreases No. 17a and 17c more than 2 P. D. For an example, as in the previous No. 37 or 20a test, in No. 16a and 16c we found 20. blur and 17. recovery, and in No. 17a and 17c we found 18. blur and 15. recovery. Now in this No. 20b test we have added minus 1.00 D. Sph., O. U. In a convergence stress the findings would be changed something like the following: For bases-out 23. blur and 20. recovery, and for bases-in 17. blur and 15. recovery. The same example for an accommodative stress then the findings would be changed something like the following: For bases-out 21. blur and 18. recovery, and for bases-in 15. blur and 12. recovery. This minus 1.00 D. Sph., O. U., added to the best visual acuity in a convergence stress has influenced the No. 16a and 16c to an increase of 3 P. D., and it has influenced No. 17a and 17c to a decrease of only 1 P. D., and in an accommodative stress it has influenced No. 16a and 16c to an increase of only 1 P. D. and has influenced No. 17a and 17c to a decrease of 3 P. D. The findings under this heading are not used at this time, in this quantitative analysis method, but as in the No. 37 or 20a these findings are valuable check tests, for such cases that do not type in a certain typical manner.

The purpose of this brief outline which we have called "A Method of Optometric Quantitative Analysis by Certain Interpretations of the Findings From a Routine Examination," is to make an effort to create and develop such a quantitative optometric analysis method. In order to do this we must have a mathematical value for each and every low or high finding. The simplest means for accomplishing this is as follows: For every 0.25 D. Sph. high or low count just 1. unit. For every 1. P. D. high or low count just 1. unit. There should be no objections to this. We know there cannot be objection to the prism value. The 1. unit to every 0.25 D. Sph. value is almost equal to 1. unit for every 1.00 P. D. Of course, there is a variation from this in most every individual but at the same time this 1. unit for every 0.25 D. Sph. can be considered a good average. So when we place a certain test in a certain type group we must show the quantity of the high or low and is shown by inclosing the number of the test and the quantity. The quantity is expressed last, the number of the test first. Example (4-2). The two is the quantity and the four is the number of the

test. If it is low it will be placed below the line, if high, above the line. After all findings have been put in their proper places we will then have six different types, and the quantity in each type is totaled, which is a picture of the number of units in each type needing attention. Very seldom do we find a certain type case wherein there are no units showing. The general procedure then will be to give attention to the type case that shows up with the most units and let the next highest type influence us in the treatment.

This outline is not presented as being anyways near perfect in its working but it is believed that it is one step nearer to something that will prove to work more satisfactory than past methods. One hundred cases have been studied by this method and they show we are able to determine the best thing to do for each and every case better than anything that has been used before. While one hundred cases are not enough to set up a system and call it a perfect working system, nevertheless, they have proven enough to show the possibility of developing such a method to the extent that it could be counted on strongly for favorable results.

In typing the pathological findings we find that there are seven tests that are placed in this A type case.

(4-1) (8-1) (10c-1) (11c-1) (13b-1) (16c-5) (17c-3)

Please note that in the 16c test there must be as much as 5 units low before this test can count as a pathological finding. Less than 5 units may only indicate inattention or a very temporary fatigue. Also that the 17c test must be as much as 3 units low before this test can count as a pathological finding. Less than 3 units may indicate only a very temporary stimulation. Generally speaking, when the A type is showing up strong, but not necessarily dominant, we should be careful about the lens correction. That is, too much plus may irritate such a patient.

In typing the accommodative insufficiency findings we find that there are seven tests that are placed in the B1 type case.

B1 Type Case:

(4-1) (5-1) (14-1)

(11a-1) (13a-1) (15-1) (17a-1)

Generally speaking, such a picture showing up strong would indicate the need of bifocals.

In typing the findings indicating exercises with prism bases-in, we find that there are seven tests that are placed in this B2 type case.

B2 Type Case:

(6-1) (10c-1) (16b-1) (16c-1)

(3-1) (11b-1) (17b-1)

Generally speaking, when this type shows up strong it indicates that an increase in plus correction over an old weaker plus correction

must have base-in exercise to enjoy the extra plus found, which would otherwise cause discomfort for a while.

In typing the findings indicating a convergence stress and needing prism bases-in for constant wear, there are seven tests that are placed in the C1 type.

C1 Type Case:

(11a-1) (13b-1) (15-1)

(5-1) (9-1) (14-1) (16a-1)

Generally speaking, when this type shows up strong and the B2 type is next in dominancy, we must be careful not to give too much prism base-in for constant wear on the start, or we must give base-in exercise in combination with the prism bases-in for wear.

In typing the findings indicating a convergence stress which is in need of base-out exercise, to best care for the trouble there are seven tests that are placed in the C2 type case.

C2 Type Case:

(3-1) (11b-1) (11c-1) (17b-1)

(6-1) (10b-1) (16b-1)

Generally speaking, when this type is showing up strong, the patient will relish an extra amount of plus correction found in the subjective test or a little added to it (just 0.25 D. Sph.). Because increased plus correction is equivalent to a mild base-out prism exercise. However, there is need for base-out prism exercise when this type is dominant. Especially when the B1 type is not next dominant.

In typing findings indicating a favorable result for the patient there are six tests that are placed in this type case.

N Type Case:

(9-1) (10b-1) (16a-1) (17a-1) (17c-1) (19-1)

When this type case is dominant we have nothing to worry about. We can go ahead with whatever treatment is indicated with assurance that the patient will get satisfactory results. A cylinder correction may be slightly off axis and the amount may be too little or too much without any disturbance to the patient, a slightly over or under correction of the spherical element will not disturb the patient or cause discomfort. Of course, such carelessness is not advocated. In fact, the optometrist cannot be too careful with his subjective examination. In other words, patients with N dominancy are only in need of glasses to improve the vision.

Following are the six types of cases wherein there is one type dominant in each case:

"A" TYPE DOMINANT

Type A:

(11c-3) (16c-24) Total 27 units

Type B1:
(4-1) (14-2)
(13a-1) Total 4 units

Type B2:
(6-1) (10x-2)
(11b-2) (17b-6) Total 11 units

Type C1:
(11a-3) (13b-1) (15-4)
(9-8) Total 16 units

Type C2:
(10b-2) (16b-6) Total 8 units

Type N:
(16a-2) (17a-4)
Total 6 units

"B1" TYPE DOMINANT

Type A:
Total 0 units

Type B1:
(5-2) (14-6)
(11a-3) (13a-12) (15-3) (17a-7)
Total 33 units

Type B2:
(10c-1) (16b-4)
(3-1) (11b-1) Total 7 units

Type C1:
(13b-15)
(9-2) (16a-6) Total 23 units

Type C2:
(17b-6)
Total 6 units

Type N:
(10b-3) (17c-9)
Total 12 units

"B2" TYPE DOMINANT

Type A:					
	(8-1)		(16c-5)	Total	6 units
Type B1:	(4-1) (5-1)				
		(11a-2)	(13a-2)	Total	6 units
Type B2:	(10c-11)	(16c-10)			
			(17b-7)	Total	28 units
Type C1:					
			(16a-1)	Total	1 unit
Type C2:	(11c-1)				
				Total	1 unit
Type N:	(9-1) (10b-6) (17a-5)				
				Total	12 units

"C1" TYPE DOMINANT

Type A:					
	(8-1)		(16c-10) (17c-1)	Total	12 units
Type B1:	(4-1)	(14-7)			
	(11a-7)		(15-6)	Total	21 units
Type B2:		(10c-8)			
				Total	8 units
Type C1:			(13b-3)		
	(5-1) (9-2)			(16a-32) Total	38 units
Type C2:	(3-8)	(11b-5)	(11c-4)		
		(6-1)		(16b-6) Total	24 units
Type N:		(10b-1)	(17a-7)		
				Total	8 units

"C2" TYPE DOMINANT

Type A:	(10a-3) (16c-7)	Total 10 units
Type B1:	(4-2) (5-2)	
	(11a-3) (13a-1)	Total 8 units
Type B2:	(10c-1)	
		Total 1 unit
Type C1:	(13b-3)	
	(16a-4)	Total 7 units
Type C2:	(11b-3)	
	(16b-15)	Total 18 units
Type N:	(10b-2) (17a-2) (17c-4)	
		Total 8 units

"N" TYPE DOMINANT

Type A:	(4-1) (10c-3) (11c-1) (13b-7)	Total 12 units
Type B1:	(5-2)	
	(13a-4)	Total 6 units
Type B2:	(6-3) (16b-9)	
	(11b-2) (17a-3)	Total 17 units
Type C1:	(15-9)	
		Total 9 units
Type C2:	(3-2)	
		Total 2 units
Type N:	(9-14) (10b-25) (16a-35) (17a-23)	
		Total 97 units

These six types, wherein one each type is dominant, have been selected from the one hundred cases studied. No doubt there are cases which will show higher units in each type that is dominant.

A further study of these cases is being given in groups with their dominances and comment on the groups.

Since the findings with the ophthalmoscope are not included in the picture of the A type case, we must comment on these findings. The record of the ophthalmoscopic findings are of the greatest value in determining whether or not the patient is in need of medical treatment. Regardless of the A type picture when there are found indications with th ophthalmoscope of pathology, these findings are of prime importance and should be given the first and most careful consideration. Should the ophthalmoscopic findings be negative we have yet to look to the color fields for any further evidence of pathology existing. Again, regardless of the A type case picture, the color fields are next in importance to the ophthalmoscope, and should the color fields test show a pathological picture this test should be given most careful consideration. Should the ophthalmoscopic findings be found negative and the color fields also show negative, then we have our A type case to look to for information as to the health condition of the patient. All tests in the A type picture are functional tests, therefore, we say that an A type case being dominant shows that whatever the pathology is it is nevertheless upsetting the normal and smooth functioning of the eyes.

From the one hundred cases used in this study (these were selected because they were under forty-five years of age and we had a complete record of all tests used in this analysis), we are listing below cases that were dominantly A type.

Wrights	A-27 Units	C1-16 Units	B2-11 Units	C2-8 Units	N-6 Units	B1-4 Units
B. McM	A-26 "	C1-13 "	C2-11 "	B2-6 "	N-3 "	B1-1 "
S. S.	A-26 "	N-23 "	B2-11 "	B1-7 "	C2-6 "	C1-1 "
G. H. D.	A-23 "	N-19 "	C2-12 "	B1-8 "	B1-1 "	B2-1 "
V. M. L.	A-25 "	C1-21 "	C2-6 "	B1-5 "	N-3 "	B2-3 "
J. D. M.	A-22 "	C1-18 "	N-17 "	B2-17 "	C2-6 "	B1-2 "
W. E. H.	A-12 "	B2-12 "	N-9 "	C1-7 "	C2-5 "	B1-1 "
R. W. B.	A- 9 "	N-9 "	B2-8 "	B1-7 "	C1-7 "	C2-1 "

None of the above cases could be made comfortable with optometric treatment.

From the one hundred cases studied, following is list of those showing the N type dominant, with B2 next highest:

N-97 Units	B-17 Units	A-12 Units	C1-9 Units	B1-6 Units	C2-2 Units
N-69 "	B2-20 "	B1-20 "	A-15 "	C1-9 "	C2-5 "
N-57 "	B2-19 "	B1-15 "	C2-13 "	C1-7 "	A-7 "
N-55 "	B2-26 "	C1-15 "	A-14 "	B1-0 "	C2-0 "
N-42 "	B2-17 "	A-11 "	B1-9 "	C1-9 "	C2-7 "
N-41 "	B2-10 "	C1-10 "	C2-10 "	B1-8 "	A-4 "
N-40 "	B2-11 "	A-7 "	C2-6 "	C1-4 "	B1-1 "
N-38 "	B2-10 "	C1-11 "	B1-9 "	C2-1 "	A-1 "
N-38 "	B2-10 "	B1-8 "	C1-8 "	C2-0 "	A-1 "
N-36 "	B2-30 "	B1-12 "	C1-4 "	C2-4 "	A-0 "
N-35 "	B2-25 "	B1-7 "	C1-5 "	A-4 "	B2-1 "
N-35 "	B2-21 "	C1-7 "	C2-7 "	B1-3 "	A-1 "

N-35 "	B2-10 "	B1-6 "	C1-4 "	C2-4 "	B1-2 "
N-33 "	B2-16 "	A-12 "	C2-8 "	B1-6 "	A-4 "
N-33 "	B2-16 "	C1-14 "	B1-12 "	A-11 "	C1-3 "
N-27 "	B2-10 "	C1-8 "	C2-6 "	B2-5 "	C2-0 "
N-26 "	B2-8 "	C1-6 "	C2-6 "	A-3 "	B1-1 "
N-22 "	B2-13 "	C2-6 "	C1-6 "	A-4 "	B1-2 "
N-17 "	B2-7 "	A-5 "	C1-5 "	C2-5 "	B1-2 "
N-15 "	B2-12 "	B1-5 "	C2-5 "	C1-5 "	A-0 "

The above are cases that do not give trouble, neither do they need any optometric treatment or optical aid other than a fairly good correction of the manifest astigmatism and spherical correction giving best visual acuity for distance wear.

Of the one hundred cases typed those with the classification of the N dominancy and the A next in dominancy are listed below:

N-52 Units	A-28 Units	B2-22 Units	C1-13 Units	C2-6 Units	B1-5 Units
N-34 "	A-19 "	B2-9 "	C1-9 "	C2-4 "	B1-3 "
N-31 "	A-10 "	B2-8 "	B1-3 "	C2-3 "	C1-0 "
N-28 "	A-26 "	B2-15 "	C1-4 "	C2-3 "	B1-1 "
N-27 "	A- 9 "	B2-8 "	B1-7 "	C1-5 "	C2-5 "
N-22 "	A-15 "	B2-13 "	C1-9 "	C1-2 "	C1-1 "
N-20 "	A-17 "	B2-6 "	B1-5 "	C1-4 "	C2-1 "
N-20 "	A-15 "	B2-9 "	B1-8 "	C1-4 "	B2-1 "

The above cases show a prominence of general fatigue but the N dominance make them easier to handle. These cases have ocular discomfort usually due to uncorrected astigmatism and can be made comfortable regardless of the general fatigue by a fairly good correction of the manifest astigmatism and spherical correction.

Of the one hundred cases typed with the classification of the N type dominance and the C1 next highest are listed below:

N-34 Units	C1-13 Units	B1-8 Units	B2-5 Units	A-5 Units	C2-0 Units
N-13 "	C1-14 "	A-13 "	C2-11 "	B1-9 "	B2-6 "
N-21 "	C1-11 "	A-9 "	B2-6 "	B1-3 "	C2-1 "

The above cases are pictures of those that will not be troublesome. Besides the N dominancy, the C1 type is needing most attention. Besides correcting the refractive error, we should give prisms base-in for constant wear. These prisms will not cause any discomfort, at least the patient will not be annoyed by the distortion that base-in prisms give on the start.

Of the one hundred cases typed with the classification of N dominancy and the C2 type next highest, the following are listed:

N-43 Units	C2-11 Units	A-9 Units	B2-8 Units	C1-6 Units	B1-5 Units
N-40 "	C2-10 "	B1-9 "	B2-6 "	A-2 "	C1-1 "
N-33 "	C2- 8 "	C1-7 "	B1-6 "	B2-0 "	A-0 "
N-31 "	C2-13 "	B1-9 "	A-9 "	C1-5 "	B2-3 "

The above cases are ones which are not at all troublesome. They are in need of all plus correction that can be given the patient with tolerance. In other words, a slight blurred correction will not raise

any serious objection from the patient, if such a B1 type shows up next strong. As plus lenses give the effect of prism base-out exercise (mild), and since C2 type indicates such a need, the patient will find comfort with the strong plus correction for constant wear without the prism base-out exercise.

Of the one hundred cases typed showing the N dominancy and the B1 next highest, the following are listed below:

N-50 Units	B1-13 Units	C1-11 Units	B2-10 Units	C2-8 Units	A-0 Units
N-39 "	B1-11 "	B1-9 "	C2-5 "	C1-4 "	A-4 "
N-34 "	B1-21 "	C2-13 "	C1-12 "	B2-8 "	A-8 "

The above cases are pictures of ones not at all troublesome. They are in need of more plus for close work than at distance. They will enjoy a pair of bifocals and accept them without the discomfort that is often experienced by some people when they are first put on. This type does not refer to presbyopes only. When the B1 type shows up strong, regardless of age, bifocals are indicated, and when the N type is dominant and the C2 type is next highest to the B1 as shown above, bifocals are the best kind of treatment in the case.

Of the one hundred cases studied, we are listing those of the C1 type dominancy below:

C1-36 Units	B2-25 Units	N2-17 Units	B1-4 Units	C2-0 Units	A-0 Units
C1-35 "	B2-11 "	C2-11 "	B1-5 "	N-4 "	A-2 "
C1-32 "	A-18 "	N-14 "	C2-16 "	B1-8 "	B2-6 "
C1-29 "	B1-14 "	N-10 "	B2-9 "	C2-9 "	A-1 "
C1-26 "	B2-9 "	C2-9 "	N-6 "	B1-3 "	A-0 "
C1-24 "	C2-11 "	B2-10 "	B1-5 "	A-5 "	N-1 "
C1-23 "	B2-19 "	N-7 "	B1-6 "	C2-6 "	A-3 "
C1-23 "	B2-13 "	C2-9 "	A-7 "	N-4 "	B1-2 "
C1-21 "	A-13 "	C2-9 "	B2-6 "	B1-6 "	N-1 "
C1-20 "	B1-14 "	C2-10 "	B2-8 "	A-8 "	N-6 "
C1-20 "	C2-10 "	A-13 "	B2-6 "	B1-1 "	N-0 "
C1-17 "	B2-15 "	N-7 "	A-5 "	B1-0 "	C2-2 "
C1-17 "	C2-11 "	N-8 "	B1-6 "	B2-4 "	A-0 "
C1-17 "	B1-5 "	N-5 "	C2-5 "	B2-3 "	A-1 "
C1-13 "	A-8 "	C2-7 "	B1-5 "	B2-2 "	N-1 "
C1-11 "	A-8 "	B2-6 "	C2-5 "	N-4 "	B1-0 "

The above cases are pictures of the ones that are most troublesome. They are in need of base-in prisms for constant wear, but due to the N type not being next dominant and in some cases lowest, these cases are most unsatisfactory. No doubt the best procedure in such types is to insist on orthoptics before prescribing glasses. The orthoptics should be continued until the N type becomes dominant, next dominant or at least stronger. If the N type does not become strong, next strongest or improved by the training, after the twelfth training period, then we should dismiss the case without further efforts. It is quite apt to be a problem needing other than optometric treatment. Unless there is considerable astigmatism manifest or high hyperopia or high myopia, glasses will not be worn until the condition presenting such pictures are remedied.

Before concluding, it has been suggested that we briefly state the expecteds in each test.

No. 3. Orthophoria.
No. 4. Same as No. 7.
No. 5. Net findings same as No. 4.
No. 6. Net findings same as No. 4.
No. 7. No expected.
No. 8. A change of No. 3 influenced by No. 7, for every plus 1.00 D. S. O. U. increased exophoria 2 P. D. or reduce exophoria 2 P. D. For every minus 1.00 D. S. O. U. decrease exophoria 2 P. D. or increase exophoria 2 P. D.
No. 9. In orthophoria for No. 8 there should be 12 P. D. to complete blur. Esophoria increases the expected 1 P. D. for every 1 P. D. esophoria, and exophoria decreases the expected 1 P. D. for every 1 P. D. of exophoria.
No. 10b. 6 P. D. more than No. 9.
No. 10c. 3 P. D. less than No. 9.
No. 11a. In orthophoria for No. 8 there should be 5 P. D. to complete blur. Esophoria decreases the expected 1 P. D. for every 1 P. D. of exophoria, and exophoria increases the expected 1 P. D. for every 1 P. D. of exophoria.
No. 11b. 2 P. D. more than No. 11a.
No. 11c. The same as No. 11a.
No. 13a. 6 P. D. of physiological exophoria.
No. 13b. A change of No. 13a influenced by No. 7 for every plus 1.00 D. S. O. U. increase exophoria 2 P. D. or reduce esophoria 2 P. D., for every minus 1.00 D. S. O. U. decrease exophoria 2 P. D. or increase esophoria 2 P. D.
No. 14. Plus 1.00 D. S. more than No. 7.
No. 15. Increase No. 13b 1 P. D. for every plus .50 D. S. O. U. increase found in No. 14 over No. 7.
No. 16a. Twice as much as No. 13c shows.
No. 16b. 6 P. D. more than No. 16a.
No. 16c. 3 P. D. less than No. 16a.
No. 17a. A total of No. 13c and No. 11a.
No. 17b. 8 P. D. more than No. 17a.
No. 17c. The same as No. 17a.
No. 19. According to age in Donders table.

When the findings in these tests are found less than the expecteds they are low, and when more than expecteds they are high findings.

We suggest that the readers go over this outline again, taking each type case separately and reading in the order as the tests in each type case are given.

A type case findings. The tests are as follows: No. 4, No. 8, No. 10c, No. 11c, No. 13b, No. 16c and No. 17c.

A Type Case:

(4-1) - (8-1) - (10c-1) - (11c-1) - (13b-1) - (16c-5) - (17c-3)

B1 type case findings. The tests are as follows: No. 4, No. 5, No. 11a, No. 13a, No. 14, No. 15, No. 17a.

B1 Type Case:

(4-1) - (5-1) - (14-1)

- (11a-1) - (13a-1) - (15-1) - (17a-1)

B2 type case findings. The tests are as follows: No. 3, No. 6, No. 10c, No. 11b, No. 16b, No. 16c, No. 17b.

B2 Type Case:

(6-1) - (10c-1) - (16b-1) - (16c-1)

(3-1) (11b-1) (17b-1)

C1 type case findings. The tests are as follows: No. 5, No. 9, No. 11a, No. 13b, No. 14, No. 15, No. 16a.

C1 Type Case:

(11a-1) - (13b-1) (15-1)

(5-1) - (9-1) (14-1) (16a-1)

C2 type case findings. The tests are as follows: No. 3, No. 6, No. 10b, No. 11b, No. 11c, No. 16b, No. 17b.

C2 Type Case:

(3-1) (11b-1) - (11c-1) (17b-1)

(6-1) - (10b-1) (16b-1)

N type case findings. The tests are as follows: No. 9, No. 10b, No. 16a, No. 17a, No. 17c, No. 19.

N Type Case:

(91-) - (10b-1) - (16a-1) - (17a-1) - (17c-1) - (19-1)

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COMMENT

DR. A. M. SKEFFINGTON, ST. LOUIS, MO.: This paper gives ample evidence of an immense amount of work and much superb clear thinking.

The author goes far beyond the officially taught analytical and corrective methods of the Graduate Clinic Foundation.

Particularly the corrective groupings of Dr. Walker are definitely of his own devising and from his own very great experience.

The interesting aspect of the paper is the radical departure from the old and established "Structural Basis" in optometric thinking.

We have come definitely to the understanding that the problems confronting the practitioner in the art of re-adapting the visual apparatus are not those of abnormal shape of the eyeball or the weakness or strength of muscle, but to the violation of an established "brain pattern" of innervation and inhibition.

In this paper is sufficient material to keep the thinking members of the profession busy for many years. There is further cause for rejoicing in that it lies strictly within our own claimed territory in the world of correction.

Dr. Walker has kept his determinations within the confines of the accepted standard minimum examination. The steps are numbered to correspond. This is in accord with the realization that a uniform examination, uniform procedure, characteristic offices and a unique and true uniform phrasing must become current in optometry.

This paper cannot be read once and lightly cast aside. It must needs be studied, paragraph by paragraph, and each point fully comprehended before the next idea is attacked. Much comment has been made concerning "Mechanical Diagnosis." It should be fully realized that the analytical case typing of the graduate clinics and the "Corrective Typing" of Dr. Walker, are simply ordered pathways of thinking. Nothing could be less "mechanical" than either. They are both the orderly summing of facts, leading to a reasoned and effective conclusion.

The Academy is indeed fortunate that Dr. Walker, long one of our most earnest and loyal Fellows, allowed it to be presented to the profession through the American Academy of Optometry.

THE ART OF OPTOMETRY*

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and
Elmer E. Hotaling, Opt. D., F. A. A. O.
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The *science* of optometry never lacks eager hands to help it on its way; its vital importance is never overlooked; it is molded and remolded with minutest care; and it is eminently fitting that its steady and, let us add, its sturdy development thus be insured. The *art* of optometry is not so favored.

Hence with the highest regard for the science we wish to say a word for the art.

In speaking of it as an art we mean optometry as it applies to the care of the visual welfare of the patient in the broadest sense in contradistinction to optometry as a series of technical measurements based upon the purely scientific laws of optics. Here is no conflict. It is fundamental that we attain to a firm mastery of the laws of light and lenses in their relation to the human eye, that instruments of precision be perfected to translate these laws of optics into visual betterment and that no slightest detail be left unconsidered in the improvement of lens, chart, ophthalmometer, perimeter, refractor, and ophthalmoscope but beyond all this we must master the *art* of optometry if the patient is to be granted the full measure of benefit optometry holds for him. Science builds a house, art turns it into a home. Optometry remains a cold science until art warms it with heartfelt human interest.

Our contributions in the field of ophthalmometer, dynamic retinoscope, visual test apparatus, astigmometer, refractor, interpupillary gauge, kratometer and ophthalmoscope permit our praising the art without seeming to do so at the expense of the science; we value both, believe that neither should be favored over the other, that in any well-rounded practice of optometry the science and the art must be conjugate. Most aptly has it been said that while science uses one eye and art the other, wisdom uses both. It is this wisdom, attainable only through

*An abridgement of the material presented before the American Academy of Optometry at Chicago, December 18, 1932.

a fusion of science and art, for which, as students and practitioners of optometry, we must strive.

A kind, assuring word to the unhappy patient being examined or putting on much-dreaded glasses for the first time; simple instructions in rational ocular hygiene and prophylaxis; advice on proper lighting in home, office, workshop, and nursery; guidance to proper protection where of necessity the light must be excessive or otherwise ill-suited; urging of adequate rest periods and of care in the selection of type and paper; these and a hundred other useful offices beyond the actual measurement and prescription for corrective lenses go to make up what we believe constitutes the art of optometry.

This applies with peculiar force to the young student who in most of the present-day courses of study is led to lay too great stress upon and place too implicit faith in laboratory methods. Geometric optics, principles of instrumentation, correction of schematic eyes, and even the theory of practice seem so exact, are so exact in fact, as to make it difficult to realize that though he may be absolute master of these he is not yet a competent optometrist if he minimizes the importance of the art of practice. Without bitterness, though with some anxiety, we see innumerable instances of the old practitioner who did not receive training in later super-scientific courses being looked down upon by the young graduate. Yet the older practitioner succeeds because of his higher development of the art while the super-scientific novitiate fails lamentably because of his failure to develop the art along with the science. But neither succeeds fully, and never will, until the development of the art parallels that of the science, with both on a high plane. A vast gulf lies between treating myopia as a science and treating a myopic patient as an art; the science does not include the art, the art of necessity includes the science.

The art of optometry cannot be learned from books. It must be learned at the chair. No better post-graduate training for the beginner can be conceived than practical work under a competent optometrist who has learned from years of experience to apply the art of optometry on top of a science base. Optometry as a profession is woefully remiss in neglecting this phase of training. Courage, tolerance and unselfishness in far greater quantities than the past has contributed will have to be forthcoming if this imperative need in optometry's broader development is to be met.

Adequate appreciation of the art is the sole safeguard against the most sincere worker losing sight of the patient in a too predominating interest in his specific defect.

So assuming the full flowering of the science let us look a little more closely at some of the elements that go to make up the art of optometry—the all-essential complement to the science.

First, an optometrist must like his work, respect it, hold its proper practice in higher esteem than anything else in the world. Herein must he find his joy, his spiritual recompense for all the labor he expends—

he must glow with a deep, enduring, unquestioning enthusiasm which in itself insures a sympathetic understanding of the patient's troubles.

Getting the history is an art in itself and constitutes the most important point of contact with the science. Often the patient is more than anxious to tell his troubles, many of them irrelevant; again he is anxious to hide important facts; but as friendly guide or relentless detective the optometrist must run down and capture the essentials by knowing when, just when, to interrupt, when not to interrupt, in order to bring the salient factors to the forefront.

The successful practitioner of the art of optometry will know his tools whether these be his hands, his eyes, his judgment or his scopes and o-meters. He will know how to make an examination so thorough, so evidently painstaking and genuinely trustworthy that the patient not only sees it, feels it, appreciates it but without prompting—there's the art—proclaims it inwardly to himself and outwardly to the world, and is safe in so doing.

Art is needed in graciously keeping costs within the means of the sensitive patient by doing not one whit less nor one whit more than should be done for that patient's highest good.

Surely art is called for in telling just enough in serious cases to obtain full co-operation or in getting word to some member of the family without alarming the patient whose condition is too serious to tell him of directly.

Art must be employed in anticipating and counteracting, without creating enmity, the disastrous, heart-breaking interference of over-zealous "friends."

A proper appreciation of the value of the art will wipe out prescription seeking and especially that nefarious practice which now exists in too many quarters of swapping a pathologic case for a couple of prescriptions. Such artfulness is the very antipodes of the art and as such should be condemned before it rots more of the base upon which optometry stands. The art of optometry needs pruning of much hang-over commerical deadwood, not as pernicious as that just mentioned, but still harboring those elements which, blind to the costs to themselves and coldly unmindful of the cost to the profession, prostitute that profession recklessly, ruthlessly, and, adding insult to injury, sanctimoniously.

He who evaluates justly himself and his art will be ambitious but that ambition will take the form of a self-evident desire to succeed; to succeed in a broad sense; to acquire a competence sufficient to insure freedom to practice as one believes best and freedom from all temptation to act in any but the patient's best interests, acknowledging the belief that therein lies his own best interests; to achieve genuine success by first believing his work to be of the highest order and then earning a position at the top. Such an ambition can do nought but inspire

him to harder work and his patients to greater confidence—a confidence that means so much to both if not betrayed.

Self-confidence will be cultivated but only in an atmosphere of trustworthy knowledge and experience.

The proper practice of the art demands sufficient ability, nay a sufficient reserve of ability, to insure an equanimity, an inperturbability which rings true because it springs from an honesty of heart, an honesty of head, a pure, untrammeled intellectual honesty. Honesty is good policy anywhere, it is all-essential principle in a profession.

The highest practice of the art of optometry calls for strict adherence to the resolve to slight nothing, a genuine thoroughness in every detail of every case. A dignity that is not pomposity. A sportsmanship that is not familiarity. A frankness and earnestness that leaves out criticism and gossip. A punctuality—the courtesy of kings—that is not obtained by undue hurry. And above all, a courage sufficient to sustain one in doing always that which is more useful against that which is more spectacular. Who dares say there is a science or deny there is an art of getting and keeping patients? Has optometry developed that phase of the art?

There remain many other phases of this subject you may wish to add, some of those we have touched upon you may wish to modify or reject, but that is not the point, we have nowhere hoped to cover every detail but rather to sketch in bold outline a picture of a more highly perfected art which, blending with our already highly perfected science, would instantly galvanize optometry into new life.

Here's to the art of optometry, may it be granted its proper place beside the science without lowering the plane of the science.

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A CASE LEADING TO THE STUDY OF THE ACCOMMODATION-CONVERGENCE RELATIONSHIP*

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In giving this paper I do so with the full knowledge that I have not any definite conclusions to offer and that any attempt to do so will be largely through assumption and mere speculation. I propose to give the facts relative to a case taken from the files in my office and I sincerely trust it will bring before this group questions and problems worthy of serious discussion.

Patient: Mr. E. G. P. Age 26.

The patient consulted me in February of this year. He was wearing the following correction: O. U. + 0.50 D. Cyl. axis 90 ⊃ 3$^{\Delta}$ base-out, fitted by me two years before after, I must admit, a rather cursory and hasty examination. I had at that time stressed the need for orthoptic treatment, but the patient was indifferent to my advice and nothing more was done for him.

On the date of the second visit he reported that the correction furnished him two years before had been very satisfactory, had given him comfort and, so far as he could tell, clear vision. He had come to me to obtain my opinion as to whether or not his eyes could be straightened without surgical intervention.

Objective Symptoms:

1. Decided exotropia; O. S. being the fixing eye.
2. Deviation of O. D. varies under observation (no nystagmus).
3. Exotropia becomes lessened when patient views close objects.
4. Patient is able, with mental effort, to converge to within 3 or 4 inches.
5. Pupils: Medium in size, reaction to light normal.

History:

1. Exotropia has existed as long as he can remember.
2. Has never experienced diplopia.
3. Is able, knowingly, to produce binocular single vision but when he does so vision is blurred.

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*An abridgement of the material presented before the American Academy of Optometry at Chicago, December 19, 1932.

Examination:

P. D.—70½ mm.
Vision (naked)—O. D. 25/30—2. O. S. 25/25.
Vision (old Rx)—Slightly blurred.

1. Ophthalmoscope—Negative.
2. Keratometer: O. D. 5—45¼, 95—46. O. S. 180—45¼, 90—46.
3. Habitual Phoria—Esophoria 40Δ.
4. Static skiametry, monocular fixation: O. D. + 1.00 D. Sph. O. S. + 0.50 D. Sph.
   Static skiametry, binocular fixation: O. D. — 2.00 D. Sph. O. S. — 1.50 D. Sph.

(With the latter correction the vision was clear but objects seemed far away.)

5. Dynamic skiametry omitted because of difficult fixation.
6. Subjective: O. D. — .25 Sph.; vision 25/25. O. S. —plano; vision 25/25.
7. F. and L. test: Recognition of E with total of 32Δ base-out.
8. Fusion: Using the Keystone Telebinocular and split cards, fusion and depth perception was good when cards were set at position of esophoria 10Δ. Depth perception was also obtained with regular stereo cards, although secured with great effort. Fusion was much better and easier with the minus correction determined in static skiametry.
9. Amplitude accommodation: I admit my neglect to take this but as there were no asthenopic complaints I assumed it to be normal.

Discussion of Examination:

You will note that vision in the deviating eye is practically as good without correction and as good with correction as the fixing eye. This would lead one to suspect that the case is at least partially alternating although the office examination did not disclose it. The amount of astigmatism as found by the ophthalmometer is little more than the expected physiologic. The absence then of astigmatism in the skiascopic and subjective tests is not surprising. It could be of little consequence in this case at any rate.

You might almost think that the record of the esophoria was in error after telling you that the case was one of decided exotropia. Using the disassociation method of 5Δ base up over O. D. there was found to be an actual esophoria present. I was quite careful to check on this and observing the eyes behind the phorometer they could plainly be seen to be turning nasalward.

The static findings are perhaps the most interesting of the case. As shown in the history, the patient could knowingly produce binocular blurred vision. So I obtained the static finding by blocking off either eye with the opaque disc and then with both eyes uncovered I requested the patient to bring both eyes into use. Telling him to hold

them thus I quickly, at intervals, ascertained the static finding under this condition, using the lowest illumination possible. With this latter correction, which you will note is minus of considerable amount, in place, the eyes were straight and vision was clear although the letters were smaller and seemed farther away.

It was most surprising that, notwithstanding the lifelong standing of the exotropia and that diplopia had never been present, the patient was easily able, in the F & L test, to distinguish the E. I might add that I never tell the patient what to expect in this test. More surprising still was the fact that the patient possessed a very good grade of depth perception.

It is most regrettable that I was unable to go any further with the case. The patient was advised that the possibility of straightening the eyes seemed good but that very little could be accomplished without his wholehearted co-operation in regard to orthoptic training, etc. The patient evidently felt the results would not warrant his co-operation, or perhaps he hesitated because of the attendant expense. At any rate I have not seen him since.

I had planned to furnish the correction in minus and endeavor to reduce it as coordination of the two functions, accommodation and convergence, was developed.

Summary and Speculation:

The chain of questions which naturally arise in my mind follows:

1. Why, with such keen vision and such good stereopsis did these eyes ever turn out in the first place? Why did they not turn in? Why did they turn at all?

2. Could the minus found be the normal ciliary tonicity said to be present in all eyes?

3. Could this case be an actual example of how myopia is developed by reflex stimulation of the ciliary through the convergence function?

4. Could this exotropia be caused by the nerve flow to the ciliary reflexly over-stimulating the convergence to the extent that the eyes give up binocular vision and thus revert to their primary anatomical position, becoming devoid of any nerve flow to the convergence?

5. Does this case not prove that accommodation or convergence may stimulate one another and that it is not true that accommodation is the dominant function, nor is convergence?

6. Is, after all, single binocular vision so much desired in preference to keen vision.

Addenda:

I had intended to conclude this paper at this point but in order to start the discussion in the most logical sequence I am going to briefly outline my understanding of some of the underlying physiology of binocular vision. I shall welcome any criticism.

In the development of the coordination of the two eyes the evolution runs somewhat as follows: Before birth the eyes occupy a position of divergence, corresponding to the position of the orbits, until about the seventh or eighth month. At this time innervation to the convergence starts and at the time of birth the eyes assume the position of approximate parallelism. We are led to the conclusion that this is a natural development corresponding to the evolution of the development of binocular vision in man through the ages. During this time a more or less fixed ratio between the innervation to the functions of convergence and accommodation is established. I believe that the foregoing has been accepted for the time being at least by the majority of our authorities.

It is further said that we are born without binocular vision and that we actually see two objects when viewing but one. Gradually we learn to know that these two images are one and the same and thus fusion is developed. During this period we develop another ratio of innervation between the functions of accommodation and convergence, *viz.*: Psychic convergence which is that convergence brought about by the awareness of the nearness of an object; accommodative convergence which is that convergence which habitually associates with it the necessary accommodation for keen vision at any one particular point; and lastly fusional convergence which is that convergence brought about by the desire to produce fusion, or oneness, of the two images. All this is in addition to that innervation allotted during fœtal life to produce parallelism. Now in the consideration of the case at hand what could have happened to interrupt the normal sequence of development?

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REMOTE CASE HISTORY

In the practice of any of the healing arts the taking and recording of the Case History is one of the vital phases of the work. To enable any practitioner to successfully understand the problems with which he is faced in making a diagnosis, he must carefully review, not only the immediate symptoms which were responsible for the patient's visit to his office, but he must also review the Personal Case History as it relates to matters in the past.

This is true, as I have said, in the practice of any of the healing arts and as such, therefore, it applies with force to the practice of optometry. Much essential data is secured in every well handled case through the taking of the Case History which must include, aside from a review of the immediate ocular symptoms, a study of the Personal Health Habits and the Personal Health Record of the patient as well.

According to Jagolinzer[1] the inquiry into the remote history of the case should naturally cover all things as localized surgical interference in the eye, severe pathological problems and eye injuries which the patient might consider not at all pertinent, having happened long ago, but which may be very vital indeed in our understanding of the problems

[1]Carl Jagolinzer. Case History. The Rhode Island Optometric Journal. Vol. 5, No. 5, pp. 6-7, 1933.

presented. Nor must there be overlooked the problem of the family history as far as the eyes are concerned for there is undoubtedly a certain amount of pre-disposition towards certain developments which must be given close attention. From this point it is of course very easy to step into the questioning regarding the family health and the past and remote health history.

Has there been any very serious adult illness, any problems which would lead to an understanding of the innervational disturbances in the eye, such as nervous breakdown and all similar general problems? It is difficult for the average patient, complaining of his eyes, to understand that severe illness, in the past, may have a very great bearing on his eye problem at the present time. Questioning might well be directed along the grouping of the symptoms under the great body systems the respiratory, the circulatory, the gastro-intestinal, the genitory-urinary, the muscular-skeletal and the nervous systems. And if indications from previous questions show interference that might affect any one of these bodily systems, questions might well be directed along these various bodily systems themselves. Included in this obviously, would be the digestive problem in the one system. Other conditions which have been considered localized but are really a part of one of the bodily systems must be considered such as sinus problems, which would be included in the respiratory system.

Then there comes the expected conditions which seem to accompany age wherein, from an elderly person, questions would lead to the condition of the blood pressure, stomach disorder, and all the other conditions to which age is subject.

Personal case history is of value solely as it is liable to reflect in the analytical summing up of the symptoms as given in the other determinations; anything that will have bearing on the value of the quantitative findings is of prime importance. In the family history, the existence of tuberculosis, rendering the patient liable to iritis, phlyctenular conjunctivitis, orbital periostities and other manifestations showing a general breaking down of the patient's resistance, will also tend to increase fatigue manifestations.

Particularly, syphilis, with all its attendant ills, both visible in iritis, keratitis, choroiditis and like symptoms, but with its more subtle sapping of reserves, well calculated to deceive in diagnosing; the same is true of rheumatism, with its sequalea of scleritis, glaucoma, cyclitis, iritis and the like, but showing a lowering of reserves most important in the ocular manifestations.

History of Glaucoma is important, for it tends to repeat in succeeding generations while acute in one, may be chronic and undetected in the second. Heart disease of any type give ocular discomfort as a secondary effect.

So the patient is asked, and frankly, for history of rheumatism, tuberculosis, gnorrhea, syphilis; indications of diabetes, heart trouble, any signs of anemia, in fact, all the list of personal possible trouble.

When done in a tactful and serious manner and recorded fully on a chart provided for this purpose, the taking of the ocular as well as the Remote Case History will give the optometrist a greater and more complete grasp of the case upon which he is to work. The patient expects competence, thoroughness and a marked degree of interest on the part of the examining doctor and as a prerequisite for these things and as a mighty complement to them, the Personal Case History becomes one of the foundation stones in the structure of proper refractions.

—C. C. K.

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BOOK NOTICES

FUNDAMENTALS OF PRACTICE AND ANALYSIS IN OPTOMETRIC EXAMINATION. By S. K. Lesser, Opt.D., F.A.A.O. Second Edition. Published by the Author at the Texas National Bank Building, Fort Worth, Texas. 110 pages. Illustrated. Cloth. $3.50. December, 1933.

Not having seen a copy of the first edition of this work by Lesser, the writer is therefore unable to compare this second edition with the preceding edition, and will therefore have to confine this review to the second edition only.

As is to be expected, this work deals with the matter of ocular refraction from the now popular "18 point diagnostic outline" viewpoint. The Author is the right-hand man of Dr. A. M. Skeffington, who is busily engaged in holding refractive clinics and graduate classes in nearly every State of this Union. In these graduate classes the "18 point" diagnostic refractive technics are taught.

The book itself is, in a great measure, a hand book of these teachings, and as such probably fulfills a need. The work is divided into two portions, the first being devoted to a more or less detailed description of the various refractive tests to be made, and the second portion to the authors and probably Skeffington's interpretations of the findings as gotten by the various specific technics as recommended and developed by the foregoing tests.

In part one Lesser has done very nicely although the writer regretted the apparent need for brevity, as in my opinion this part of the work would be of greater value had Lesser included more of the available material to which he but briefly refers. However, as this portion of the book is obviously written for the optometrist equipped with but the most meager knowledge of ocular refraction it is probable that Lesser purposely omitted some of the more modern refinements such as the Tait Technic of Skiametry, etc., in order that his readers would have an easier time grasping the fundamentals which he mentions. It might be said, however, that for the college man who has come through during the past fifteen years there is little but review in part one of this book.

Part two bristles with such terms as "Diagnostic Chains," "Key Symptoms," "Case Typing" and "toxic" this-or-that. All this verbosity is, of course, part of Skeffington's armament and naturally must be included in a work of this kind, written as it is, for use in his graduate classes. These terms, however, while they add nothing to the value of the technics to which they are applied, are in the final analysis, merely another way of saying,—"the application of common sense in the matter of interpreting refractive data," and as many men have been more or less confused at times as to just how to interpret this or that refractive result, the author, using the Skeffington formulas, has done a very nice piece of work in clearing up the relationships of the various findings as gotten during the refraction.

Without a doubt, Skeffington and Lesser are doing a fine work in prying many men from the "ruts" into which they had fallen and are again arousing in them the desire for a greater knowledge of their refractive work. Lesser, in this book, is to be congratulated. The book is simply written. Part one at least can be understood by the most backward optometrist, and yet, much of interest will be found in part two by the advanced thinker, and in addition, it avoids, in the main, the "flowery-language" used by Skeffington.

From time to time the writer, as editor of this JOURNAL, has been criticized by his readers for not publishing material dealing with this particular type of diagnostic thinking. Readers have pointed out, and truthfully so, that the "18 point diagnostic outline" was seldom or never mentioned in the literature of our profession and some have gone so far as to say that the editors of our technical publications (including the writer) are prejudiced against this work, Such, however, is not the case.

The content matter of the AMERICAN JOURNAL OF OPTOMETRY is carefully selected, months in advance, from many submitted manuscripts, and only such papers which seem to offer something of general interest are accepted. During the last three years only one paper in which these technics of Skeffington and Lesser were mentioned, has come up to these standards and it just happens that that paper is presented to the profession in this issue of the JOURNAL. The paper mentioned, written by Dr. R. N. Walker, comes to the JOURNAL through the Academy.

The AMERICAN JOURNAL OF OPTOMETRY, as well as all other technical ocular journals, welcomes well written material and the writer would be glad to receive manuscripts dealing with the diagnostic phases of refractive work, written from the viewpoint of the user of the "18 point diagnostic outline."

Lesser has added to the literature of our profession and it is hoped that others of the followers of Skeffington will do likewise during 1934.

—C. C. K.

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